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STUDIES OF EDUCATIONAL PRINCIPLES

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I. TYPES OF CORRELATION

When the doctrine of correlation was first stated it carried with it a kind of immediate conviction. Everyone realizes that mental processes get their character from their associations. The same fact falls into two different minds. In one mind it branches out into a score of productive lines of thought; in the other it falls lifeless because there are no suggestive associations. By all means let us group around every item of experience productive associations.

The schools took up the suggestion with avidity. Teachers devoted themselves to the discovery of new and interesting associations. They even went farther. They began to invent associations. The writer has a clipping which sets forth the possibility of a novel nature-study lesson to be given on Lincoln's birthday. Because Lincoln freed the slaves, and because the slaves came from Africa, from whence the elephant also comes, the elephant is to be made a subject of special study on February 12. Of course this is not a typical example of that which the advocates of correlation would have us do in the schools, but it makes clear by its extreme character the necessity of defining what is the limit of productive correlation.

Our problem, accordingly, is not to find possible correlations, but to find productive correlations. To this end let us draw a distinction which will be helpful in marking off productive from unproductive associations.

All human experience has justified the bringing together of certain typical methods of thought without reference to the objects to which these methods of thought are applied. The most obvious case of this development of a method of thought is to be found in the science of geometry. All triangles have certain common characteristics, whether they are made of wood or stone or paper or air. We come therefore to think of triangles without reference to the material which fills them. We reason about triangles. We relate triangles to quadrilateral figures and to many-sided figures. The reason for thinking about all of these different figures together is that we thus cultivate a type of thought, a method of reasoning. In a very proper sense all triangles are correlated with each other and all triangles are correlated with all lines and all quadrilaterals.

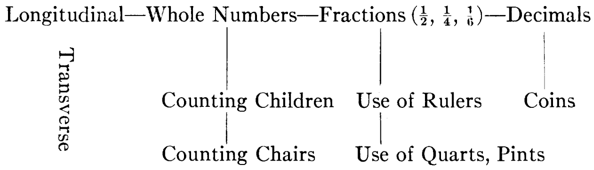
In like manner all number relations are correlated with each other. As soon as one establishes a method of adding three and five, he has established a method of adding three and fifteen, three and twenty-five, and so on. The method of adding three is a uniform intellectual operation whether it occurs today or tomorrow, whether it is applied to apples or houses.

Differences in methods of thought explain many of our distinctions between the sciences. Thus if I think about the formation of land areas and their relations to bodies of water and other land areas I am in a geographical attitude of mind. My method of thinking is the same, whether I deal with Africa or Asia or America. I can lay down certain broad definitions which apply alike to all countries and all times. While I am interested in these geographical matters the correlations which are most obvious are all of the geographical type.

The interesting fact about many discussions of correlation is that the obvious lines of correlation just described are ignored. To many thinkers correlation of number facts means the taking of these facts out of their arithmetical connection and the placing of them in some other connection. Thus the fraction $\frac{1}{2}$ is part of a number scheme. It may be also a part of a cooking lesson, as when one wishes to divide a cupful or a quart into equal parts. Many thinkers would regard it as a true example of correlation to bring the fraction $\frac{1}{2}$ into the cooking lesson, but would fail to recognize that there is just as much correlation in relating $\frac{1}{2}$ to $\frac{1}{4}$ or to $\frac{1}{6}$.

Again the facts of history may be correlated in temporal order or they may be taken out of their temporal order to be coupled with facts of location. Many teachers would be conscious of an effort to correlate if they coupled a geographical fact with a historical fact, but would never think of using the term correlation if they proceeded from one point in history to the next.

For the purpose of defining the two types of connection which have been under discussion in the foregoing examples, let us speak of longitudinal correlations and transverse correlations. The following diagram will illustrate what is meant by the terms longitudinal and transverse.



With the distinction between longitudinal correlations and transverse correlations clearly in mind, it will readily be seen that the longitudinal connections are much more systematic and orderly while the transverse connections are illustrative and concrete. The longitudinal connections depend, it will be remembered, on certain methods of thought.

Our problem in any particular case is: Which type of connection will contribute most to the training of the pupil? We need not stop to ask whether there is correlation or not, for there will always be some correlation, some connection in the mind between experiences. For no experience can ever stand alone. There will always be either forward movement in some system of well-organized knowledge or transverse movement crossing over from systematic knowledge to concrete application.

If the case is put in terms of our ordinary discussion of school problems we should say, arithmetic is a progressive system of knowledge about number facts. When the pupil learns a little about numbers he can go farther by following the same method of thinking and can thus master more and more fully the system of strictly arithmetical ideas. We stop, however, all along the line and let the child note not merely the arithmetical facts but their application also. Thus we teach the child to add, and then we teach him that adding will help him to count more rapidly all his possessions. Then we teach him that men add in stores and on the stock exchange. We relate his arithmetic to things which he knows and to many things which he does not know. In these applications we go outside of arithmetic and exemplify transverse correlation.

There are two reasons given for the emphasis of transverse correlations. First, the incidental concrete facts, such as use of rulers and quart measures, are supposed to furnish strong motives which impel the pupil to follow more willingly than he otherwise would the longitudinal series. The longitudinal series is supposed to be difficult and devoid of all natural interest.

Second, the transition from arithmetic to concrete facts is supposed to train in the applications of arithmetic. In later life, we are told, the facts will not present themselves in orderly arithmetical procession. They will come incidentally in the form of things to be measured and weighed. Children should therefore prepare to deal with the facts as they come.

These reasons for emphasizing transverse correlations can and should be met by cogent reasons for the emphasis of longitudinal systems of thought.

First, children have a great aptitude for what we call purely logical relations. Thus the child who was interested in discovering the last number was absorbed in a purely arithmetical problem. Again, the child is filled with interest when he first discovers that the order of the numerals is the same in the fifties and sixties as it is before he reaches ten. The properties of fractions are of absorbing concern to the child who grows up in a social environment which is at all commendatory of his efforts. It is a mistake to assume that children are not capable of longitudinal associations. The race has moved along these longitudinal lines in its intellectual evolution. In the schools of every generation it has been possible to train children in these longitudinal lines, as is evidenced by the criticism of the schools for cultivating exclusively these associations.

These facts may not justify us in repeating the mistake of the earlier school which trained exclusively in longitudinal correlations, but they certainly justify us in emphasizing the fact that longitudinal systems of thought are not wholly foreign to the pupil's nature.

With regard to the plea that children should apply the principles of arithmetic, there can hardly be any disagreement. Do applications interfere with the longitudinal correlation? Not at all. Indeed, it is not until the pupil has some command of the principles of arithmetic that he is in a position to apply these principles. Thus a child who has no real knowledge or appreciation of a fraction will be very much confused by the effort of the teacher to apply the fraction to a problem in cooking. The problem in cooking is so complicated in itself and it has so many natural associations with other problems in cooking that the mind does not travel readily from the kitchen to the abstract methods of reasoning suggested in number. The race to which the advocates of the mixture of cooking and number so often refer, did not mix the two issues. There was a time and place for cooking and a time and place for the cultivation of number. Indeed, in the experience of the race these two interests were usually taken care of by entirely separate people. Only in the latest stages of culture when arithmetic was a mature science and the practice of cooking was well established, did the race apply the methods of exact measurement to the practical problem. In other words, application of arithmetical science is a late stage of development. Put in terms of our earlier diagram, number was matured as a longitudinal system before transverse relations became possible.

This paper is a plea for the recognition of longitudinal systems of training. It should not be regarded as an attack upon all transverse correlations. Transverse correlations are legitimate when the mind is ready to carry over productively its matured systems of thought. The need of emphasis in educational thought of our day does not seem to lie in the direction of these transverse correlations. Our generation needs to consider the importance of certain fundamental longitudinal correlations. These are natural and legitimate. They have grown up as a result of racial experience. They are the traditional lines along which training in the schools has moved. We should not abandon them lightly.

In a subsequent paper the problem of applications will be treated more fully. It is not assumed that the examples cited above have disposed of the matter. It is contended, however, that the possibility of a productive longitudinal association has been fully established, even when one is looking forward to practical applications. The conclusion to which we have arrived is that longitudinal correlations are at least as legitimate and productive as any other type.

[*To be continued*]